

# **DRAFT UGANDA STANDARD**

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## **Plastic baby feeding bottle — Specification**

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## Foreword

Uganda National Bureau of Standards (UNBS) is a parastatal under the Ministry of Trade, Industry and Cooperatives established under Cap 327, of the Laws of Uganda, as amended. UNBS is mandated to coordinate the elaboration of standards and is

- (a) a member of International Organisation for Standardisation (ISO) and
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- (c) the National Enquiry Point on TBT Agreement of the World Trade Organisation (WTO).

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Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

The committee responsible for this document is Technical Committee UNBS/TC 303, [*Plastics and related products*].

# Plastic baby feeding bottle — Specification

## 1 Scope

This Draft Uganda standard specifies requirements, sampling and test methods for plastic feeding bottles used for nursing babies.

This standard does not cover teats (nipples) and glass feeding bottles

## 2 Normative references

The following referenced documents referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

US 1675, *Determination of overall migration of constituents of plastic materials and articles intended to come into contact with food stuffs - Methods of analysis*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1

#### **baby feeding bottle or feeding bottle or nursing bottle**

bottle for feeding babies and young children

### 3.2

#### **nominal capacity**

the volume indicated by the manufacturer that represents maximum recommended filling level at  $27\text{ °C} \pm 2\text{ °C}$

### 3.3

#### **accessories**

all components of the plastic baby feeding bottle except the bottle teats (nipples)

### 3.4

#### **brimful capacity**

volume of liquid held by the baby feeding bottle when filled to the point of overflowing at  $27 \pm 2\text{ °C}$

## 4 Requirements

### 4.1 General requirements

- 4.1.1** The feeding bottle shall be of suitable design, shape and required-dimensions
- 4.1.2** The shape shall be such that it is easily cleanable and does not permit the food remnants to remain stuck inside the feeding bottles.
- 4.1.3** The body of the feeding bottle shall be smooth, both internally and externally, free from any defects like cavities, crevices, hooks, embedded foreign matters, detrimental bubbles, streaks, flaws and stains,
- 4.1.4** The brimful capacity shall exceed the nominal capacity by a minimum of 15 percent.
- 4.1.5** The minimum scale mark and interval marking shall not be more than 20 percent of the maximum scale indicating mark.
- 4.1.6** The scale marks and the indicating numerical values shall be clear and shall not be affected by high temperature sterilizing treatment
- 4.1.7** The feeding bottle and its parts shall not have sharp edges and sharp points that could cause injury to the user
- 4.1.8** If the feeding bottle is unprinted, the capacity scale shall be engraved on the bottle and if the bottle is printed, the capacity scale shall be clearly printed

### 4.2 Specific requirements

- 4.2.1** The plastic baby feeding bottle shall conform to the specific requirements in Table 1 when tested in accordance with the test methods prescribed therein

**Table 2 – Specific requirements for baby feeding bottles**

| S/N  | Characteristic                             | Requirement   |    | Test method |
|------|--|---|----|-------------|
| i    | Migration of plastic constituents          | No migration  |    | US 1675     |
| ii   | Transparency (min), %                      | Polycarbonate bottle  | 85 | Annex B     |
|      |  | Polypropylene bottle  | 60 |             |
| iii  | Permanency of pigment                      | Printed impressions do not become illegible   |    | Annex A     |
| iv   | Rapture and leakage                        | No sign of rupture or leakage   |    | Annex C     |
| v    | Pressurized deformation resistance, max, % | 10  |    | Annex D     |
| vi   | Aging resistance/ ink adhesion             | No significant removal of the print from the surface of the container and the print shall be legible to the naked eye |    | Annex E     |
| vii  | Wall thickness, mm                         | Within $\pm 10$ of declared value   |    | Annex F     |
| viii | Bisphenol-A, min, mg/kg                    | 0.05  |    | Annex G     |

4.2.2 The capacity of feeding bottles shall be as indicated in table 2.

**Table 2 – Capacity of baby feeding bottles (Maximum indication scale)**

|  |        |         |         |
|--|--------|---------|---------|
| <b>Indicated Capacity in ml</b>              | 40-200 | 210-290 | 300-450 |
| <b>Tolerance on Maximum indication scale</b> | ±4     | ±5      | ±6      |

## 5 Packaging

The feeding bottle shall be packaged in suitable containers that guarantee product integrity during transportation, storage and handling.

## 6 Labelling

6.1 Each feeding bottle shall be permanently marked with scale mark.

6.2 Each package containing the bottles shall be permanently marked with the following:

- a) name and physical address of the manufacturer
- b) name of product as, “baby feeding bottle” or “baby bottle” or “nursing bottle”
- c) nominal capacity;
- d) batch number /code number
- e) date of manufacture (month and year)
- f) material used (resin code)
- g) country of origin
- h) cleaning and sterilization instructions
- i) instructions for disposal and recycle
- j) shelf life

## 7 Sampling

The sampling shall be done in accordance with Annex H

## **Annex A** (normative)

### **Test for permanency-of pigments**

#### **A1 General**

This test is meant only for those feeding bottles which have a printed scale and graduations.

#### **A2 Reagents**

**A.2.1** Sodium Dichromate

**A.2.2** Concentrated Sulphuric Acid, Relative density, 1.834

#### **A-3 Procedure**

**A.3.1** Weigh about 20 g of sodium dichromate and dissolve in 1500 ml of concentrated sulphuric acid and dilute to 2500 ml with water. Immerse the bottles in the solution at room temperature for 15 min. Rinse the samples with water and dry.

**A.3.2** The bottles shall be taken as having satisfied the requirements of the test if the printed impressions do not become illegible.



## Annex B (Normative)

### Determination of Transparency

**B.1** Test specimen shall be prepared from the part of feeding bottle where scale marks or other marks are not found.

**B.2** Apparatus – Light transmittance measurement device

**B.3** Test specimen – The size of test specimen shall be 50 × 50 mm and the thickness shall be the original thickness of the test specimen. Three test specimens shall be prepared.

**B.4** Measurement – Install the white standard plate, adjust the reading ( $T_1$ ) of the device's current meter to be 100; adjust the amount of incident light. Under the status where the white standard plate is installed, install and measure the test specimen to obtain the indication ( $T_2$ ) of the current meter. The full light transmittance shall be calculated according to the following formula:

$$T = \frac{T_2}{T_1} \times 100$$

Where

T full light transmittance (percent).

## **Annex C** **(Normative)**

### **Drop test**

#### **C.1 Sample size**

The sample size shall be ten bottles, taken at random from a batch, divided into two sets of 5 each, designate as Set 1 and Set 2.

#### **C.2 Procedure**

**C.2.1** Fill each bottle with water at ambient conditions and close tight with closures.

**C.2.2** Drop the bottles under free fall conditions in Set 1 squarely on their base on to a rigid flat horizontal surface of steel or smooth concrete as the dropping surface.

**C.2.3** Drop the bottles under free fall condition in Set 2 on their side (the body of the bottle being parallel to the impacting floor) onto the dropping surface.

**C.2.4** Examine each bottle for signs of rupture or leakage.

## Annex D (informative)

### Compressive deformation test

#### D.1 Procedure

Apply the compressive load of 2kg in the middle part of the body or to the part having the maximum diameter of a feeding bottle by the use of compression. Measure the deflection of the part at that time, and calculate percentage deflection. The measurements shall be carried out at  $27 \pm 2^\circ\text{C}$

$$D = \frac{D_1 - D_2}{D_1} \times 100$$

Where

- D Percentage of deflection of diameter
- D<sub>1</sub> Outside diameter prior to test
- D<sub>2</sub> Outside diameter at the time of compression

## **Annex E** **(Normative)**

### **Determination of Aging resistance and ink adhesion**

#### **E.1 Aging resistance**

##### **E.1.1 Procedure**

**E.1.1.1** Immerse the bottles into the boiling water for 20 min, then immediately into the ice water for 20 min alternately and repeat it 3 times. At the end of the test, the change in the capacity of bottles shall not be more than 1 percent and also there shall be no defective changes in the bottle.

**E.1.1.2** There shall be no significant changes in appearance when the accessories are tested in accordance with the method in Annex F

#### **E.2 Ink adhesion**

##### **E.2.1 Procedure**

**E.2.1.1** Apply two strips of 25 mm wide transparent pressure sensitive tape or cello tape to the printed area of container; one piece down the length of the container and the other round the circumference.

**E.2.1.2** Press the tape firmly on to the container and leave it for 15seconds.

**E.2.1.3** Remove the tape by pulling slowly at about 1 cm/s from one end at about 90° to the container surface.

**E.2.1.4** There shall be no significant removal of the print from the surface of the container and the print shall be legible to the naked eye after the test

## **Annex F** (normative)

### **Determination of wall thickness**

#### **F.1 Apparatus**

Micrometer/screw gauge, fitted with ball point tips or dial caliper gauge fitted with spherical anvils giving an accuracy of measurement of 0.02 mm.

#### **F.2 Procedure**

The container wall thickness shall be ascertained by either of the methods indicated below

##### **F.2.1 Micrometer method**

Cut the plastic feeding bottle horizontally into three pieces (top, middle and bottom) Measure the wall thickness with a micrometer or screw gauge fitted with ballpoint tip, at four places in each section. Take the average of four readings and report as wall thickness at top, middle and bottom.

##### **.F.2.2 Dial caliper gauge method**

Measure the wall thickness with the help of dial caliper fitted with spherical anvils. Care shall be taken to avoid movement of the container during measurement as this may affect the reading obtained. The measurement shall be to an accuracy of 0.02 mm. Take the mean of three readings at any location (top, middle and bottom) as wall thickness.

## Annex G (normative)

### Determination of Bisphenol A

#### G.1 Introduction

Plastic food packaging or containers are produced with the help of plasticizers or additives used in plastic manufacture to improve its flexibility, stability, or resistance properties. Among these additives, 2,2-bis(4-hydroxyphenyl)-propane (Bisphenol-A) is a monomer used for the synthesis of polycarbonate (PC). Bisphenol A (BPA) is a monomer used to make polycarbonate plastic and epoxy resins. Traces of BPA can leach out of these polycarbonate plastic surfaces under various environmental conditions such as heat or pH changes and eventually are consumed by humans.

#### G.2 Reagents and materials

- G.2.1 Purified water
- G.2.2 Acetonitrile (HPLC grade)
- G.2.3 Methanol (HPLC grade)
- G.2.4 Potassium phosphate monobasic
- G.2.5 Standards of bisphenol A

#### G.3 Chromatographic parameters

The chromatographic parameters for reverse phase liquid chromatography.

- G.3.1 Column: C18 4.6×100 mm 5 µm or 4.6×100 mm 1.8 µm
- G.3.2 TCC temperature: 40 °C
- G.3.3 FLD: Ex: 230. Em: 316
- G.3.4 FLD acquisition rate, gain: 9.26 Hz, 15
- G.3.5 Sample thermostat: 4 °C
- G.3.6 Mobile phase A: 10 mM monobasic potassium phosphate in water
- G.3.7 Mobile phase B: 100% Acetonitrile
- G.3.8 Flow: 0.9 mL/min
- G.3.9 Injection volume: 20 µL. 5 sec needle wash at flush port for 5 sec, using mobile phase A.

**G.3.10 Gradient: Time**

| Time (min) | %B |
|------------|----|
| 0          | 5  |
| 2          | 5  |
| 2.1        | 35 |
| 12.5       | 35 |
| 12.6       | 70 |
| 17         | 70 |
| 18.1       | 5  |
| 23         | 5  |

**G.4 Standard preparation****G.4.1 Preparation of stock solution**

Weigh accurately the BPA standard, dissolve in 100% methanol to obtain stock solutions of about 300 µg/mL store at 4 °C when not in use.

**G.4.2 Preparation of standards BPA**

Prepare freshly a 400 ng/mL solution of BPA by diluting the stock solutions using the dilution buffer of 5% acetonitrile and 95% 10 mM monobasic potassium phosphate in water

**G.5 Sample preparation**

Add 250 mL boiling water into baby bottle. Place baby bottle in boiling water for 30 minutes. Transfer the water from the baby bottle into amber colored bottles. Acidify using concentrated HCl to pH 2.0 and store at 4 °C. Precondition SPE using 6 mL methanol and 6 mL water. Add 50 ml acidified water, elute using 2 × 4 mL of 100% methanol. Evaporate under a stream of nitrogen at 60 °C and reconstitute in 1 mL of dilution buffer.

**G.6 Procedure**

Inject blank. Inject standard preparation in five replicate and record the chromatogram. It should comply with system suitability.

Inject sample preparation in duplicate, record the chromatogram and calculate the percent content of BPA.

## Annex H (Normative)

### Sampling

#### H.1 Scale of sampling

##### H.1.2 Lot

In any consignment, all the bottles of the same material, size and drawn from a single batch of manufacture shall be grouped together to constitute a lot

##### H.1.2 Scale of Sampling

For ascertaining the conformity of the lot to the requirements of this standard, tests shall be carried out for each lot separately. The number of bottles to be sampled from a lot shall be in accordance with Table H1.

**Table H1 – Scale of sampling and acceptance number**

| SN | Lot Size       | Manufacture, workmanship, finish and appearance |                   | For transparency, leakage, ageing resistance, compressive deformation resistance, Bisphenol A and Ink Adhesion for Printed Bottles |                   |
|----|----------------|---|-------------------|--|-------------------|
|    |                | Sample size                                     | Acceptance number | Sample size  | Acceptance number |
| 1  | Up to 500      | 13  | 1                 | 5  | 0                 |
| 2  | 501 to 1000    | 20  | 2                 | 8  | 0                 |
| 3  | 1001 to 3000   | 32  | 3                 | 13   | 0                 |
| 4  | 3001 to 5000   | 50  | 5                 | 20   | 1                 |
| 5  | 5001 and above | 80  | 7                 | 32   | 2                 |

**H.2.3** The bottles shall be selected at random from the lot

#### H.2 Criteria for conformity

##### H.2.1 Manufacture, Workmanship, Finish and Appearance

The sample bottles selected as per col 2 of Table H1 shall be examined for requirements in clause 4.1. Any bottle failing in one or more of the requirements shall be termed as defective. The lot shall be accepted under this head if the number of defective bottles in sample does not exceed the acceptance number given in col 3 of Table H1.

##### H.2.2 Capacity and wall thickness dimensions

Five bottles for a lot size up to 5000 and 10 bottles for lot size above 5000 shall be selected at random from the samples already drawn according to H.2.3. There shall be no failure if the lot is to be accepted under this clause.



**H.2.3** Permanency of pigments, Transparency, Leakage test, Ageing resistance, compressive deformation resistance and ink adhesion test. The number of sample bottles to be drawn shall be in accordance to col 4 of Table H1. Each of the sample bottle shall be subjected to the respective tests. The number of failures shall not exceed the acceptance number given in col 5 of Table H1 for all tests except leakage test. For leakage and Bisphenol-A test the acceptance number is zero, that is no failure shall occur for lot acceptance

#### **H.2.4 Drop test**

The sample bottles shall be drawn from the lot and these shall be subjected to drop test. There shall be no rupture or leakage in any bottle after the test for acceptance. In case even one bottle has any sign of rupture or leakage, the lot shall be considered as not conforming to the requirements of this specification

## Bibliography

- [1] DKS 2607: 2015, *Baby feeding bottles — Specification*
- [2] IS 14625: 1999, *Plastics feeding bottles*
- [3] *Journal of Analytical Methods in Chemistry* Volume 2019, Article ID 1989042 — *Validation of an HPLC Method for Determination of Bisphenol-A Migration from Baby Feeding Bottles*





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